REMARKS

Claims 1-13, 19-22 and 26-48 are pending in this application. No claims are allowed. Claims 19-21 and 26 stand withdrawn as directed to a non-elected invention. Please update the Patent Office records to reflect the new docket number of "NUFO-002" and the undersigned new patent counsel.

First Rejection Under 35 U.S.C. § 103

Claims 1, 5, 6, 8, 22 and 30-34 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kitamura et al. (US Patent 5,904,912) in view of Stoll (US Patent 5,902,519).

According to the Office Action:

> Kitamura discloses a method for heat treatment of lithium niobate (LN) single crystal or lithium tantalate structure (crystal) used for optical amplification device. This method comprises the steps of:
>
> heating the LN structure in a sealed heat-treating furnace, the atmosphere of the furnace is in 100% oxygen (column 11, lines 14-19). That reads on heating the LN structure in a sealed pure oxygen gas atmosphere substantially lacking in H_2O
>
> maintaining the temperature and controlling the atmosphere for 10-12 hours while heating the LN structure (column 11, lines 16-17) reads on maintaining temperature and pressure for an anneal period
>
> cooling the LN structure to room temperature (column 11, lines 18-20).
>
> Unlike the instant claimed inventions as per claims 1, 5, 6, 22, Kitamura does not disclose the step of pressurizing the sealed pure oxygen gas atmosphere to exceed ambient atmospheric pressure (2 psi -25 psi above ambient atmospheric pressure (14.7 psi).
>
> However, Stoll discloses a process for oxidizing LN comprises the steps of heating LN structure in a sealed chamber containing oxygen at a pressure between 10-100 atmosphere (147 – 1470 psi) (column 2, lines 28-30). That reads on of pressurizing the sealed pure oxygen gas atmosphere to exceed ambient atmospheric pressure.
>
> Therefore, one skilled in the art would have found it obvious to modify Kitamura by adding the step of pressurizing the sealed pure oxygen gas atmosphere to exceed ambient atmospheric pressure as per Stoll because it is known in the art that higher pressure can be used to increase the oxidizing atmosphere.
>
> Regarding claims 6, 8, 30, 33, Kitamura discloses heating the LN structure to 950°C in 10 hours (column 11, lines 17-18).
>
> Regarding claims 7 and 31, Kitamura discloses cooling the LN structure to room temperature in 10 hours (column 11, lines 18-19).
>
> Regarding claim 34, Kitamura discloses that LN structure is useful for application to an optical amplification device (column 3, lines 65-67).

According to M.P.E.P. § 2143,

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in the applicant's disclosure.

The Office Action points to "Example 3" of the Kitamura et al. reference (column 11) as providing the basis for the § 103(a) rejection. Reviewing this Example 3 in detail reveals some significant points. In each sub-example of Example 3 a flowing gas atmosphere was used: "The atmosphere of the furnace was four types i.e. in a 100% oxygen at a flow rate of 1 l/min., in a dried 100% nitrogen gas at a flow rate of 1 l/min., in a dried nitrogen gas containing 0.01% of oxygen at a flow rate of 1 l/min., and in a nitrogen gas containing steam at a flow rate of 1 l/min."

Each of the above rejected claims (i.e., independent claims 1 and 22) contains the limitation that the anneal takes place in a "sealed pure oxygen (O_2) atmosphere substantially lacking in H_2O" (emphasis added). A "sealed" atmosphere and a "flowing" atmosphere are different. In a sealed atmosphere the atmosphere is sealed – nothing goes in or out. In a flowing atmosphere there is a flow of gas in from a gas supply and a flow of gas out. All examples in Kitamura et al. quoted above involve a one-liter per minute flow of oxygen, nitrogen and/or steam. Thus Kitamura et al. fails to meet the limitations of the rejected claims. Accordingly, the rejection must be withdrawn.

Referring now to the Stoll reference (US Patent 5,902,519), this reference is also inapposite. A key portion of the invention of Stoll is to "protonate" the LN crystal by subjecting it to a steam bath (H_2O) at 600°C (column 4). The entire point of the present invention is to avoid such "protonation" – see, e.g., specification pages 6, 7. Thus to bathe the LN crystal in steam and then place it in an oxygen atmosphere does not meet the limitations of independent claims 1 and 22: "heating the lithium niobate structure in a sealed pure oxygen gas (O_2)

atmosphere substantially lacking in H_2O" (emphasis added). Accordingly, combining Stoll with Kitamura et al. would not yield the presently claimed invention because H_2O would be present in the pressure chamber, it having been applied directly to the LN in the previous step. It should also be noted that the purpose of Stoll is to carry out a chemical reaction in the iron atoms present in the LN structure used by Stoll. The present invention has nothing to do with such chemical reactions in iron. As a result, the present rejection should be withdrawn.

Second Rejection Under 35 U.S.C. § 103

Claims 2-4, 9-13, 27-29 and 35-48 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kitamura et al. (US Patent 5,904,912) in view of Stoll (US Patent 5,902,519) and further in view of Young et al. (US Patent 5,095,518).

According to the Office Action:

> Unlike the instant claimed inventions as per claims 2-4, 9-11, 35-37, Kitamura and Stoll fail to disclose the step of locating the LN powder proximate to the LN structure to retard outgassing of lithium oxide from the LN structure by separating the LN powder from the LN structure with an interface porous (porous plug).
>
> However, Young discloses a method for forming optical waveguide from LN structure comprises the step of using a thin sheet of a non-reactive material between the LN substrate and the LN powder while heating the LN substrate (column 5, lines 1-15). That teaching reads on the step of locating the LN powder proximate to the LN structure to retard outgassing of lithium oxide from the LN structure by separating the LN powder from the LN structure with an interface porous (porous plug) since Young discloses the same method (heating an LN structure) using the same material LN substrate and LN powder.
>
> Therefore, one skilled in the art would have found it obvious to modify Kitamura and Stoll by adding the step of locating the LN powder proximate to the LN structure from the LN structure by separating the LN powder from the LN structure with an interface porous/ thin sheet as per Young because Young teaches that the thin sheet / interface isolates the LN substrate from direct contact with the LN powder (column 5, lines 1-3).
>
> Regarding claims 10, 11, 39, 40, 45, 46, Kitamura discloses heating the LN structure to 950°C in 10 hours (column 11, lines 17-18).
>
> Regarding claims 13, 42, Kitamura discloses cooling the LN structure to room temperature in 10 hours (column 11, lines 18-19).
>
> Regarding claims 43, 44, 48, Kitamura discloses that LN structure is useful for application to an optical amplification device (column 3, lines 65-67).

The discussion above is equally applicable here. Kitamura et al. and Stoll are inapposite and do not yield the presently claimed invention. The addition of the Young et al. reference

(US Patent 5,095,518) adds nothing. The furnace structure of Young et al. (see, e.g., Fig. 3) appears clearly to be open and not sealed. While Young et al. suggests the use of dry or wet oxygen (column 6, lines 34-44), it is not suggested anywhere in Stoll that a "sealed" oxygen atmosphere be used. As to claims 3, 4, 10, 11, 28, 29, 36 and 37, Stoll provides no containment to separate the LN powder from the substrate. He relies on placing the substrate directly on and in contact with the powder or directly on a platinum sheet covering only a portion of the powder. No porous plugs are used. Accordingly, it appears clear that powder can be displaced onto the surface of the LN substrate, particularly where a flowing gas environment is present. Thus these claims are not even facially met by the alleged combination of references. These rejections must also be withdrawn.

Request for Allowance

In view of the foregoing, reconsideration and an early allowance of this application are earnestly solicited.

If any matters remain which could be resolved in a telephone interview between the Examiner and the undersigned, the Examiner is invited to call the undersigned to expedite resolution of any such matters.

Respectfully submitted,

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